



Name \_\_\_\_\_ Date \_\_\_\_\_

Reteaching: For use after Lesson 8.5, Algebra 2 with Trigonometry

## Distance and Midpoint Formulas

■ **Concept:** Finding the distance between two points in a plane

**Remember:** The distance formula for any two points in a coordinate plane is an application of the Pythagorean theorem.

The distance  $d$ , between two points,  $A(x_1, y_1)$  and  $B(x_2, y_2)$ , is given by this formula.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

**Example:** Find the distance between  $A(6, -2)$  and  $B(-3, 4)$ .

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(-3 - 6)^2 + (4 - (-2))^2}$$

Substitute in the formula.

$$d = \sqrt{(-9)^2 + (6)^2}$$

Simplify.

$$d = \sqrt{81 + 36}$$

Find each square; then add.

$$d = \sqrt{117}$$

Simplify.  $117 = 9 \cdot 13$

$$d = 3\sqrt{13}$$

Find the distance between the points with the given coordinates.

1.  $(3, 5)$   $(-4, 5)$  \_\_\_\_\_ 2.  $(6, -2)$   $(6, 11)$  \_\_\_\_\_ 3.  $(2, 1)$   $(3, -2)$  \_\_\_\_\_

4.  $(-3, -3)$   $(4, 1)$  \_\_\_\_\_ 5.  $(4, -2)$   $(5, 3)$  \_\_\_\_\_ 6.  $(0, -5)$   $(2, 7)$  \_\_\_\_\_

**Concept:** Finding the coordinates of the midpoint of a line segment

**Remember:** A midpoint divides a line segment into two line segments of equal length. The coordinates of the midpoint  $m$  of the line segment with endpoints

$$A(x_1, y_1) \text{ and } B(x_2, y_2) \text{ are } M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

**Example:** Find the midpoint of a line with endpoints  $(-2, -3)$  and  $(4, 1)$ .

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$M = \left(\frac{-2 + 4}{2}, \frac{-3 + 1}{2}\right)$$

Substitute.

$$M = \left(\frac{2}{2}, \frac{-2}{2}\right)$$

Simplify.

$$M = (1, -1)$$

Find the coordinates of the midpoint of the segment with the given endpoints.

7.  $(4, 1)$   $(6, -1)$  \_\_\_\_\_

8.  $(1, -1)$   $(5, 0)$  \_\_\_\_\_

9.  $(2, 4)$   $(8, 4)$  \_\_\_\_\_

10.  $(0, 0)$   $(3, 6)$  \_\_\_\_\_